NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

Civil Engineer Corps Accessions: Forecasting Interview Requirements and Travel Budgets

---

By: Max Sisson
        December 2008

Advisors: Lawrence R. Jones
              Brett Wagner

Approved for public release; distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE		*Form Approved OMB No. 0704-0188*
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.		
1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** December 2008	**3. REPORT TYPE AND DATES COVERED** MBA Professional Report
4. TITLE AND SUBTITLE Civil Engineer Corps Accessions: Forecasting Interview Requirements and Travel Budgets		**5. FUNDING NUMBERS**
6. AUTHOR(S) Max Sisson		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.		
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited		**12b. DISTRIBUTION CODE**
13. ABSTRACT (maximum 200 words) The purpose of this MBA Project is to provide insight into interview requirements and travel budgets for the Civil Engineer Corps accessions team through the use of forecasting. The goal of this project is to provide a forecasting model that can predict interview requirements and form the basis for constructing travel budgets and estimates. The primary tool utilized is spreadsheet modeling to include extensive linear regression analysis. Additional insight is provided into the application of this model and the extracted data with respect to management controls.		
14. SUBJECT TERMS Civil Engineer Corps, Accessions, Forecasting, Travel Budget, Linear Regression Analysis, Spreadsheet Modeling		**15. NUMBER OF PAGES** 47
		16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

i

THIS PAGE INTENTIONALLY LEFT BLANK

**CIVIL ENGINEER CORPS ACCESSIONS: FORECASTING INTERVIEW
REQUIREMENTS AND TRAVEL BUDGETS**

Max Sisson, Lieutenant Commander, United States Navy

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

**NAVAL POSTGRADUATE SCHOOL
December 2008**

Author: _____

                       Max Sisson

Approved by: _____

                       Lawrence R. Jones, Lead Advisor

                       _____

                       Brett Wagner, Support Advisor

                       _____

                       Terry Rea, Acting Dean
                       Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

CIVIL ENGINEER CORPS ACCESSIONS: FORECASTING INTERVIEW REQUIREMENTS AND TRAVEL BUDGETS

ABSTRACT

The purpose of this MBA Project is to provide insight into interview requirements and travel budgets for the Civil Engineer Corps accessions team through the use of forecasting. The goal of this project is to provide a forecasting model that can predict interview requirements and form the basis for constructing travel budgets and estimates. The primary tool utilized is spreadsheet modeling including extensive linear regression analysis. Additional insight is provided into the application of this model and the extracted data with respect to management controls.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

THIS PAGE INTENTIONALLY LEFT BLANK

I.   INTRODUCTION AND BACKGROUND

A.   CIVIL ENGINEER CORPS ACCESSIONS

How can an organization produce a product when the quantities of raw materials needed are unknown? Furthermore, how can a budget be produced when dealing with undefined quantities of raw materials? For the purpose of this project, these questions will be applied to the Navy Civil Engineer Corps accessions program. In this case the product is a selectable Civil Engineer Corps candidate and the raw materials are the total interviews conducted to obtain the selectable candidates. The budget is the travel budget needed to conduct the numerous interviews required to obtain each selectable candidate.

Currently, the Navy Civil Engineer Corps brings in approximately 40 to 200 new officers each fiscal year. "Civil Engineer Corps officers are the Navy's uniformed professional engineers and architects. They are responsible for executing and managing the planning, design, construction, operation and maintenance of the Navy's shore facilities" (*Jobs in the Naval Civil Engineer Corps*, 2008). The number of new officers accessed each year is based upon Naval Personnel Command's dictated requirement. The mission of Naval Personnel Command is "to support the needs of the Navy by providing the fleet with the right person in the right place at the right time, using the most efficient HR process" (*About Us Naval Personnel Command*, 2008). They ensure that the Navy maintains the proper manning levels by specifying the new officer requirement to the officer corps prior to the start of the fiscal year. The Civil Engineer Corps created their accession office to ensure the specified number of new candidates are recruited annually and that these candidates are of the highest quality. This office is led by a Civil Engineer Corps Commander who has a staff of three Civil Engineer Corps Lieutenants. The Commander generally has no prior experience with recruiting or accessions. He is located in Millington, Tennessee along with Naval Personnel Command headquarters. The three accession officer Lieutenants are employed to attract (career fairs/college presentations), interview, and rank possible candidates. The Civil Engineer Corps accession Lieutenants work within separate and independent regions.   Their offices are

1

located in Illinois, California, and Virginia. They work closely with local Navy officer recruiters who are tasked or goaled with accessing a minimum number of Civil Engineer Corps officers each fiscal year per office. These recruiters work out of 26 Naval Recruiting Districts around the United States. There is some functional overlap between Navy officer recruiters and the accession Lieutenants. However, the accession Lieutenants generally work in a support role.

B.   INTERVIEW REQUIREMENT

The most critical aspect of the accession Lieutenants job is to interview candidates. A face to face interview of candidates is a mandatory requirement. An interview takes priority over most other events. Without an interview a candidate's officer application package can not be considered for acceptance. Typically the accession Lieutenants travel to the candidate's location to perform the interview. As illustrated in the figure below, the travel distances and associated expenses can be extensive.
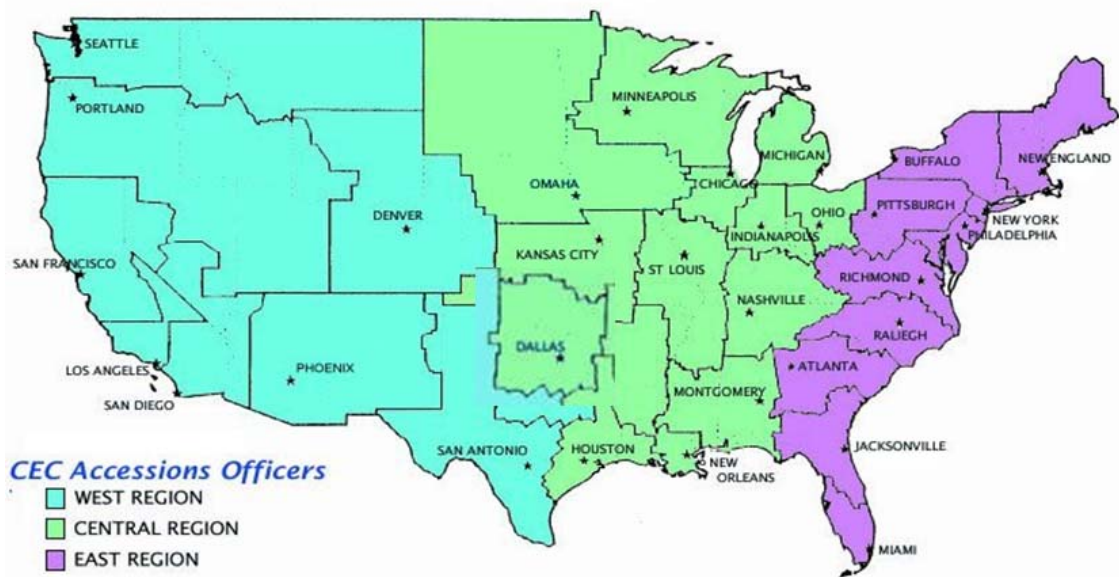
Figure 1.   Accessions Regional Map (From: Barton, 2008)

Accession Lieutenants' schedules revolve around interviewing candidates. The accession Lieutenants are highly autonomous and basically operate as one person offices. There is no minimum number of interviews required. Most importantly there is no current method to forecast the number of interviews needed to meet the number of new candidates specified by Naval Personnel Command. The interview scheduling process varies between accession Lieutenants and the Naval Recruiting Districts. The interview and additional paperwork can be completed in a matter of weeks or months depending on the motivation of the candidate, recruiter, and accession Lieutenant. Little or no guidance is given to the accession Lieutenants on the number of interviews required to meet the selection requirement. Often, the perceived selection requirements are lowered the last few months before the selection deadline which is during the summer. This observation was observed during personal experience as an accession Lieutenant.

C.   TRAVEL EXPLORED

In completion of their duties the accession Lieutenants can easily be on travel three to four days out of a typical work week. Their only deliverables are end of the month reports that summarize their travel and interview schedule for the past month. Also included is a prediction of the next six weeks of travel. This report does not include any travel cost information (Barton, 2008). The accession Lieutenants are responsible for planning and scheduling their travel. Approval for the travel is related to the availability of funding. This approval is granted by a local approval authority that does not check the purpose or details of the trip only that funds are available.

Currently, there is no yearly travel budget or forecast for the combined Civil Engineer Corps accession team. This lack of a travel budget is related to the inability to forecast the number of interviews required to meet the dictated selection requirement. The fact that there is no yearly travel budget for the accession team is compounded by the fact that travel funding is supplied from four different sources. Each accession Lieutenant receives the majority of their funds from regional funding sources to include Naval Facilities Engineering Command Atlantic, Midwest, and Southwest. Special events that involve the entire accession team are often funded directly from the fourth

3

funding source, the Civil Engineer Corps Detailer office. The accession team provides no estimate to the regional funding source as to how much they anticipate spending throughout the fiscal year. This lack of forecasting strains the local funding sources. These offices often calculate their own independent forecasts primarily based on the past year's travel expenditures by their Lieutenant. Given the fluctuation in new officer requirements, travel expenditures can vary greatly between fiscal years. This seemingly unpredictable fluctuation in expenditures is the source of stress for the regional funding sources. Also, there is no tracking of total travel expenditures for the accession team.

The lead accession officer has no visibility on total travel expenditures. Obtaining past funding data from the regional funding sources is possible but would require significant effort. Obtaining a few months of data required a direct order from the lead accession officer and several weeks to collect the information. This lack of visibility is a serious cost accounting issue. Clearly cost can not be linked to the product. The product in this case would be new Civil Engineer Corps officers. The inability to forecast the number of interviews required have created an undefined budget and non-existent budget cycle.

D.   PROJECT APPROACH

The inability to forecast interview requirements and a travel budget is addressed through quantitative spreadsheet modeling. Analysis was conducted through the use of scatter graphs, trend lines and regression analysis. The data were obtained from twelve years of Civil Engineer Corps State of the Corps Reports (1996 to 2007). Data included the number of interviews and selections over this time period. Real world variables to include pay and economic factors were added to improve the forecasting model. Current accession Lieutenants were queried for their travel expenses over a 12 month period leading to an average interview cost. The travel budget was explored by evaluating this average interview cost, manning requirements provided prior to the start of the new fiscal year by Naval Personnel Command in conjunction with the Civil Engineer Corps Community Manager, and the associated interview requirements forecast.

This project is organized around the data provided in the subsequent chapter. The data followed by the analysis answer the research questions through spreadsheet modeling with the output represented as a reference table. Furthermore, this analysis opens discussion for other applications.

THIS PAGE INTENTIONALLY LEFT BLANK

II.   DATA FOR ANALYSIS

A.   INTERVIEW AND SELECTION REQUIREMENT DATA

The primary data for this project is the annual selection requirement and corresponding number of interviews. The selection requirement field is the number of new Civil Engineer Corps officers dictated by Naval Personnel Command. The interviews field is the number of candidates interviewed to obtain the selection requirement. Logic would dictate that for a given pool of candidates a certain number of the candidates should be selectable. These candidates would possess an accredited degree, minimum grade point average, minimum level of extra curricular activities, and meet physical standards. This assumes that the selection criteria remain somewhat consistent. The data in Table 1 were provided by the Civil Engineer Corps accessions office. This data are contained in annual Civil Engineer Corps State of the Corps Reports. Reports prior to 1996 were not available from the Civil Engineer Corps accessions office.

1996	Total		2002	Total
Interviews	299		Interviews	199
Selection Requirement	106		Selection Requirement	77

1997	Total		2003	Total
Interviews	221		Interviews	115
Selection Requirement	81		Selection Requirement	42

1998	Total		2004	Total
Interviews	113		Interviews	132
Selection Requirement	48		Selection Requirement	40

1999	Total		2005	Total
Interviews	121		Interviews	99
Selection Requirement	104		Selection Requirement	49

2000	Total		2006	Total
Interviews	356		Interviews	211
Selection Requirement	170		Selection Requirement	58

2001	Total		2007	Total
Interviews	299		Interviews	215
Selection Requirement	140		Selection Requirement	69

Table 1.   Interview and Selection Numbers by Year (From: *State of the Civil Engineer Corps,* 2008*)*

B.   TRAVEL COST DATA

Current accession Lieutenants were queried for their travel expenses over a 12 month period leading to an average interview cost. In some cases all travel was local or an accession Lieutenant was on leave. These cases are indicated by lower travel costs. It was necessary to obtain the assistance of the lead accession officer to obtain the travel cost information. Even with his intervention the data call took several months and is incomplete. This is evident in the incomplete data listed in Table 3 and Table 4. Only one accession Lieutenant was able to provide the accessions Commander with a full

twelve months of travel costs. As mentioned previously there is no combined travel cost oversight. In some cases turnover between accession Lieutenants hindered the tracking. In other cases different regional funds tracking issues emerged. According to the lead accession officer he could not track travel expenditures past the current fiscal year (Barton, 2008). To accomplish this feat would most likely require a direct order from an entity that could cross all four funding sources and three regions. Even if such a data call was issued, considerable time and manpower would be required to complete the task.

Month	# of Events attended to include interviews, career fairs, and presentations	Monthly # of Interviews conducted	Monthly Total Travel Costs
1	9	6	$5,893
2	9	4	$2,443
3	13	6	$3,723
4	11	8	$2,780
5	6	4	$2,248
6	8	6	$2,368
7	6	5	$4,468
8	13	7	$4,924
9	13	5	$5,841
10	14	7	$5,958
11	4	4	$2,169
12	7	6	$2,704

Table 2.   Travel East Coast Accession Officer Region (From: Barton, 2008)

Month	# of Events attended to include interviews, career fairs, and presentations	Monthly # of Interviews conducted	Monthly Total Travel Costs
1	3	2	$0 (local)
2	9	7	$2,661
3	7	4	$2,079
4	4	2	$2,715
5	10	5	$4,539
6	9	5	$4,632
7	10	5	$4,167
8	4	2	$729
9	8	4	$3,669
10	9	2	$4,216

Table 3.   Travel Central Accession Officer Region (From: Barton, 2008)

Month	# of Events attended to include interviews, career fairs, and presentations	Monthly # of Interviews conducted	Monthly Total Travel Costs
1	7	6	$1,759
2	7	5	$4,101
3	9	3	$4,073
4	11	1	$3,660
5	8	2	$4,573
6	7	4	$2,657
7	7	5	$1,949
8	8	9	$579

Table 4.   Travel West Coast Accession Officer Region (From: Barton, 2008)

C.   REAL WORLD VARIABLES

The proposed forecasting model between interviews and the candidate selection requirement is not operating in a vacuum. While researching forecasting approaches, a study by the Rand Corporation was obtained. They evaluated many factors to include employment trends, differences in military and civilian pay, recruiter density, and military educational benefits. This project focused on national employment trends and

the differences in military and civilian pay (Cotterman, 1986, 5-15). Officer recruiter density could not be accurately estimated for this project. Since the educational benefits have remained somewhat constant this factor was not included. Upcoming changes to educational benefits could impact the proposed forecasting model. Factors representing the difference in military pay and the national unemployment rate were obtained from the public sources found in the list of references.

FY	Mil Pay Raise Percentage	Pvt Sector Raise	Comparability Gap
1996	2.4	2.9	-13.10%
1997	3.0	2.8	-12.90%
1998	2.8	3.3	-13.50%
1999	3.6	3.6	-13.50%
2000	6.2	4.3	-11.40%
2001	4.1	3.2	-10.50%
2002	6.9	4.1	-7.60%
2003	4.7	3.6	-6.50%
2004	4.2	3.1	-5.40%
2005	3.5	3.0	-4.90%
2006	3.1	2.6	-4.40%
2007	2.7	2.2	-3.90%

Table 5.   Military Pay Raise Gap (From: Military Officers Association of America, 2008)

FY	Unemployment Percentage
1995	5.6
1996	5.4
1997	4.9
1998	4.5
1999	4.2
2000	4
2001	4.7
2002	5.8
2003	6
2004	5.5
2005	5.1
2006	4.6
2007	4.6

Table 6.   Annual U.S. Unemployment Rate (From: Bureau of Labor Statistics, 2008)

As noted previously, there were limitations in the data available. Overcoming these limitations in future collection would require extensive effort and resources. By including a wide range of data a more complete analysis was able to be performed. However, the analysis discussed in the next chapter was limited by the data.

III. DATA ANALYSIS

The starting point for model development was the interview and selection data listed in Table 1. Upon collecting the data and placing it into table format, the data was plotted on a scatter graph based on number of required selections (x value) and the number of interviews (y value) to obtain the dictated selection requirement.   A linear trend line was added with the assistance of Excel. Also, with the aid of Excel the corresponding linear equation was calculated. This equation provides a forecast for the number of interviews required for a particular selection requirement.

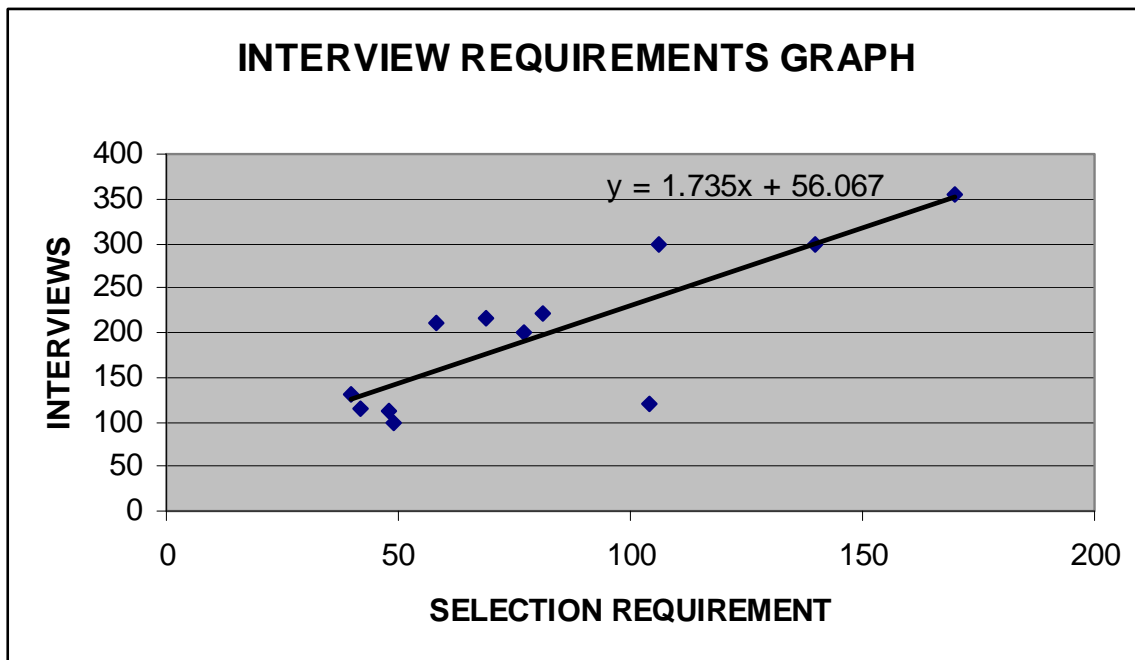Figure 2.   Interview Requirement Graph

This forecast was compared to the actual number of Civil Engineer Corps officers interviewed based on an actual selection requirement.   Mean Average Deviation (MAD) was chosen as the measure of error. MAD was used due to its ease of explanation to the accession and recruiting staff. These staffs can recognize and relate the MAD as actual interviews.

	Selected	Interviewed	Forecasted	Difference
1996	106	299	239.977	59.023
1997	81	221	196.602	24.398
1998	48	113	139.347	26.347
1999	104	121	236.507	115.507
2000	170	356	351.017	4.983
2001	140	299	298.967	0.033
2002	77	199	189.662	9.338
2003	42	115	128.937	13.937
2004	40	132	125.467	6.533
2005	49	99	141.082	42.082
2006	58	211	156.697	54.303
2007	69	215	175.782	39.218
			MAD	32.975167

Table 7.   Mean Average Deviation Table

In this case, the MAD was 32.96 interviews. A value of plus or minus 33 interviews is much better than the current non-existent forecasting available. As shown in Appendix A, an R Square value of 0.6931 was achieved through regression analysis. This goodness of fit measure provides an idea of how well the equation line approximates the real data points (Newton, Rudestam, 1999, 248-249). In this case 69.31 percent of the variation is explained by the linear equation model. Furthermore, an F significance of 0.000777 was achieved. This translates into a presumption that the model is 99.92 percent significantly or preferable to a mean model. The model's coefficient of 1.735 is 4.75 standard deviations from zero according to the T statistic (Rumsey, 2003, 233-234).

The next step involved the use of the real world variables included in the data section. By adding the pay and unemployment data, a multivariable linear equation was computed. From the regression analysis computed in Excel the coefficients documented in Table 8 were obtained.

Coeffiecient	Value
Intercept	-120.532
Selection Requirement	2.383
Pay Gap	5.386
Unemployment Rate	34.186

Table 8.   Coefficients for Updated Equation

The equation to calculate the dependent interviews required for a given year is equal to the stated selection requirement for that year multiplied by that coefficient plus the pay gap for that year multiplied by that coefficient plus the unemployment rate for the previous year multiplied by the corresponding coefficient plus the intercept. The previous years' unemployment rate was used to reflect the lengthy recruitment process and the influence of the previous year's unemployment rate. As shown in the table below the MAD for this updated equation was 33.92. Although slightly higher than the previous MAD, upon further investigation the multivariable equation is preferred. As shown in Appendix A, it has an R square of .7577. This shows that 75.77 percent of the variation is explained by the model. A forecasting model that can account for 75% of variation would be a tremendous forecasting tool. Transitioning from a system where there is no forecasting ability to one where three fourths of the variation is captured by a model is a significant improvement. There are limitations as indicated by the MAD. However, the MAD of 33.92 would translate to approximately 11 interviews for each of the three accession Lieutenants. In other words, the 25% of variation left unaccounted for by the model will result in a mean average deviation of plus or minus 11 interviews per accession Lieutenant.

Interviewed	Selected	Forecasted	Difference
299	106	252.912	46.088
221	81	187.587	33.413
113	48	88.637	24.363
121	104	208.388	87.388
356	170	366.694	10.694
299	140	293.226	5.774
199	77	182.670	16.330
115	42	142.808	27.808
132	40	150.804	18.804
99	49	157.847	58.847
211	58	168.309	42.691
215	69	180.118	34.882
		MAD	33.924

Table 9.   Updated Mean Average Deviation Table

The next section of analysis is limited due to data collection difficulties mentioned previously. Not all accession officers were able to provide the twelve months of travel costs. Also, the accessions Commander had no oversight on these costs and could not add to or validate these costs. The average cost of interviews for each accessions officer was calculated using the limited data collected. This dollar amount includes an overhead factor. Not all travel is for presentations. Some of the travel such as presentations and career fairs facilitate future interviews. Therefore, the total travel costs were used versus strictly interview related costs. By using the total travel costs, an across the board overhead factor is included. The average cost was obtained by dividing the total travel costs by the number of interviews performed that month. The table below reflects these dollar amounts:

Region	Regional Average Interview Cost
East	$669
Central	$817
West	$667

Table 10.   Regional Average Interview Cost

Once the average interview cost was established for each region, a total was calculated. A baseline average interview cost was calculated by averaging the three numbers together. This average total interview cost was calculated to be $718. No weight was placed on a particular region despite possible inequities in interview numbers. The lack of weight is due to the fact that the number of interviews conducted in a region shifts primarily based on the current accession officer and their intensity level as opposed to any regional trend or pool of candidates. Basically the region has less impact on the number of candidates interviewed than the accession Lieutenant.   The average interview cost calculation is not sophisticated. However, given the limited data the calculated value is much better than anything available to the Civil Engineer Corps accessions team. After calculating the average interview cost, this was combined with the selection model to create a reference table as shown in the partial table below. The pay gap for the year

16

2008 was utilized along with the U.S. national unemployment rate of 2007. These data are widely available and can be updated along with the selection requirement prior to the start of the fiscal year.

Selection Requirement	Estimated Interviews	Travel Expenditures
40	114	$81,647
45	126	$88,003
50	138	$94,026
55	149	$100,049
60	161	$106,072

Table 11.   Partial Interview Requirement and Travel Expenditure Forecasting Table

A more complete table of the interview requirements and estimated travel expenditures is provided in Appendix B.   This table provides a useful reference to determine the number of interviews required for a given selection requirement during the year of 2008. Also, a rough estimate of the travel expenditures is provided.

The basis of the table in Appendix B is the equation extracted during the analysis. Not only does the table represent the effort of the analysis, but it also is the basis for other applications.   The analysis provides a starting point for alternate uses, which will be presented in the following chapter.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. ALTERNATE APPLICATIONS

Currently, there is no numeric target for the number of interviews to be completed for the accession Lieutenants. Unlike their recruiting counterparts, they have no performance targets. Although sometimes abused in recruiting, some type of performance target or goal could be helpful. "Results controls are consistent with, and even necessary for, the implementation of decentralized forms of organization with largely autonomous responsibility centers" (Merchant, Van Der Stede, 2003, 24). This quote seems to fit the Civil Engineer Corps accession system. How many candidates should they have selected each month? A question of this nature has not been addressed by the accession team. This type of target would have to include trends in available candidates. Setting a target of this type would require significant effort and feedback to become an effective measurement of performance. A rough target can be constructed using the table in Appendix B.

The value in this forecast would be in the setting of performance measures and goals. For example, if the selection requirement was set at 60 Civil Engineer Corps candidates, then according to the Table 14, 161 interviews would need to be conducted. Since meeting the selection number is mandatory, the measure of error should be considered (mean average deviation of thirty four) leading to a minimum requirement of around one hundred and ninety five interviews. This could be split evenly among the three Accession Lieutenants resulting in a yearly target of 65 interviews. However, setting a yearly target would be a mistake. This would not take into account trends in the availability of candidates. From personal experience, more competitive students find jobs several months before their graduation in the summer. The students who wait until graduation or a few months after graduation to find a job tend to have lower GPA's and levels of prior work experience. These few months align perfectly with the end of the fiscal year and lead to the quality issue. A quality focused approach would be to front load the selections in the first six to nine months of the fiscal year. This would set a minimum number of interviews required by each Accession Lieutenant as shown in the table below.

Fiscal Month	Interviews
1	8
2	8
3	8
4	6
5	6
6	6
7	6
8	6
9	6
10	3
11	2
12	0

Table 12.   Monthly Interview Projection

A primary danger of setting numeric goals in recruiting is the generation of results that match the minimum required numbers. In this case by only using this measure of performance the accession Lieutenants might only interview sixty-five candidates even though having a larger interview pool would increase the potential quality and diversity of candidates. Fitness Reports could be tied to performance in logical ways.   The minimum might be a baseline that dictates an average Fitness Report. By merely evaluating the number of interviews performed, a Lieutenant could easily game the system and perform interviews on unqualified candidates. If however, the number of interviews and average interviews per selectable candidate were tied to the Fitness Report, the mission would be linked more directly to the employees.   Further performance measures besides output could be investigated such as generating new markets in previously unvisited universities, quality of average candidates, and cooperation with local recruiters. These areas are very similar to the merit rating found in the corporate world (Merchant, Van Der Stede, 2003, 140).

In addition, through the use of the table in Appendix B, it can be concluded that a specific number of interviews should yield a rough number of qualified applicants. This knowledge can be used to provide basic guidelines for accession Lieutenant performance. This should dissuade unproductive activities and interviews, thus decreasing the costs

associated with them. More simply put, accession officers would be more likely to interview candidates with a possibility of accession rather than conducting meaningless interviews for the sake of appearance or to inflate the numbers on their monthly report.

Action controls could be used in conjunction with results controls to achieve and improve mission accomplishment. During the slow month at the end of the fiscal year the accession Lieutenants could prepare their plan for the next fiscal year and pitch it at a mandatory conference for approval. Also, the accession Commander could visit one accession Lieutenant each month and observe the plan in action. This could include comparing travel activity/reports to travel claims and interaction with recruiters that the accession Lieutenant supports. These visits would also reduce the information asymmetry that is common among decentralized organizations (Merchant, Van Der Stede, 2003, 590).

These alternate applications were all made possible by expanding the basic principals of this project. By understanding what input was needed to reach the desired results and what this would cost, insight has been achieved. This insight leads the reader to conclusions that seem simplistic, but are not readily apparent to those working within the current system.

THIS PAGE INTENTIONALLY LEFT BLANK

V.   CONCLUSIONS

The research questions investigated in this project were to estimate the cost in lost opportunity to an organization operating without an understanding of what input was needed to produce a desired product, and what the effort to establish this understanding would be and what it would cost. The answer, as explained within this report, shows that the lack of a forecasting method for interview requirements and inability to forecast travel budgets has produced negative results for the Civil Engineer Corps accessions team. These results range from ambiguous performance goals to financial stress among funding sources caused by the undefined travel budget. Through data collection and analysis, a foundation for the solution was established. The reference table in Appendix B provides a basis for interview requirements, future travel budgets and gives visibility to data and analysis previously unavailable.

When asked about the benefits of a forecasting tool of this type, the current head of the Civil Engineer Corps accession team commented, "It would help quantify the cost for recruiting CEC officers and help budget for accessions in the future" (Barton, 2008). Using this data, individual accession Lieutenants could provide their regional funding sources forecasts for their yearly travel costs by referencing the table. The accuracy of these forecasts could be improved with the analysis of more interview/selection data and individual monthly travel expenditures. The later could easily be accomplished by adding a travel cost line to the accession Lieutenants monthly reports that includes the months total travel expenditures. A forecasting tool is provided in this study to the Civil Engineer Corps accessions team that can be easily improved upon through the tracking of the most recent actual financial and performance data. Furthermore, the reference tables generated from this forecasting model could form the basis for implementation of management controls to greatly improve team performance.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.832525482
R Square	0.693098677
Adjusted R Square	0.662408545
Standard Error	49.7209412
Observations	12

ANOVA

	df	SS	MS	F	Significance F
Regression	1	55830.94673	55830.94673	22.58376314	0.000777603
Residual	10	24721.71993	2472.171993		
Total	11	80552.66667			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	56.06678168	33.19974895	1.688771255	0.122149957	-17.9068685	130.0404319	-17.9068685	130.0404319
X Variable 1	1.734957947	0.365082316	4.752237698	0.000777603	0.921503857	2.548412037	0.921503857	2.548412037

Table 13.   Summary Output for Original Model

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.870485402
R Square	0.757744835
Adjusted R Square	0.666899148
Standard Error	49.38914297
Observations	12

ANOVA

	df	SS	MS	F	Significance F
Regression	3	61038.36712	20346.12237	8.341010582	0.00760826
Residual	8	19514.29954	2439.287443		
Total	11	80552.66667			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-120.5324615	199.716732	-0.603517093	0.562881266	-581.0800709	340.015148	-581.0800709	340.015148
X Variable 1	2.382598663	0.589355378	4.042719812	0.003721653	1.023542725	3.7416546	1.023542725	3.7416546
X Variable 2	5.385589929	4.538879766	1.186546066	0.269445866	-5.081085571	15.85226543	-5.081085571	15.85226543
X Variable 3	34.18576998	33.4857865	1.020903898	0.337177033	-43.03259211	111.4041321	-43.03259211	111.4041321

Table 14.   Summary Output for Multivariable Model

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

Selection Requirement	Estimated Interviews	Travel Expenditures
40	114	$81,647
45	126	$88,003
50	138	$94,026
55	149	$100,049
60	161	$106,072
65	173	$124,415
70	185	$112,095
75	197	$118,118
80	209	$124,141
85	221	$130,164
90	233	$167,183
95	245	$136,187
100	257	$142,210
105	269	$148,233
110	280	$154,256
115	292	$209,950
120	304	$160,279
125	316	$166,302
130	328	$172,325
135	340	$178,348
140	352	$252,718
145	364	$184,371
150	376	$190,394
155	388	$196,417
160	400	$202,440
165	412	$295,486
170	423	$208,463
175	435	$214,486
180	447	$220,509
185	459	$226,532
190	471	$338,253
195	483	$232,555
200	495	$238,578

Table 15.   Interview Requirement and Travel Expenditure Forecasting Table for 2008

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

About Us.   Naval   Personnel   Command.   12   October   2008
< http://www.npc.navy.mil/AboutUs/>.

Barton, John, CDR, CEC, USN. Interview with Max Sisson. 5 September 2008.

Cotterman, Robert F., Forecasting enlistment supply: A time series of cross sections model, Santa Monica: Rand Corporation, 1986.

Jobs in the Navy Civil Engineer Corps. Civil Engineer Corps. 12 October 2008.

< https://portal.navfac.navy.mil/portal/page/portal/cec/accessions>.

Merchant, Kenneth A. and Van Der Stede, Wim A., Management control systems: Performance measurement, evaluation, and incentives, New York: Prentice Hall, 2003.

Military Pay Raise Gap. Military Officer Association of America. 18 October 2008 <http://www.moaa.org/controller.asp?pagename=lac_paygap>.

Newton, Rae R. and Rudestam, Kjell E, Your statistical consultant: Answers to your Data analysis questions, Thousand Oaks: Sage Publications, 1999.

Rumsey, Deborah, Statistics for Dummies, New York: Wiley Publishing, 2003.

State of the Civil Engineer Corps (1998 to 2006) provided by LCDR Ward Doss, CEC, USN. Navy Personnel Command PERS-463,Millington, TN. Civil Engineer Corps Detailer Shop; gary.doss@navy.mil.

Where Can I Find the Unemployment Rate for Previous Years. Bureau of Labor Statistics. 18 October 2008 <http://www.bls.gov/cps/prev_yrs.htm>.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1.   Defense Technical Information Center
        Ft. Belvoir, Virginia

2.   Dudley Knox Library
        Naval Postgraduate School
        Monterey, California

3.   Commander John Barton, CEC, USN
        Civil Engineer Corps Accessions
        Millington, Tennessee